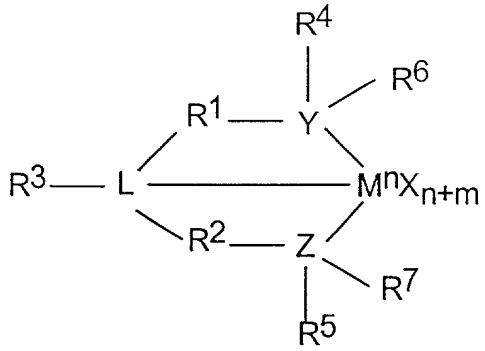
Claims:

1. A polymerization process comprising combining in the gas or slurry phase an olefin with an activator, a support and a compound represented by the following formula:



wherein

M is a group 3 to 14 metal,

each X is independently an anionic leaving group,

n is the oxidation state of M,

m is the formal charge of the YZL ligand,

Y is a group 15 element,

Z is a group 15 element,

L is a group 15 or 16 element,

R^1 and R^2 are independently a C_1 to C_{20} hydrocarbon group, a heteroatom containing group, silicon, germanium, tin, lead, phosphorus, a halogen,

R^1 and R^2 may also be interconnected to each other,

R^3 is absent, or is hydrogen, a group 14 atom containing group, a halogen, a heteroatom containing group,

R^4 and R^5 are independently an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, or multiple ring system,

R^6 and R^7 are independently absent or hydrogen, halogen, a heteroatom or a hydrocarbyl group, or a heteroatom containing group.

2. The process of claim 1 wherein M is a group 4, 5 or 6 transition metal.

3. The process of claim 1 wherein M is zirconium or hafnium.

4. The process of claim 1 wherein each X is independently hydrogen, halogen or a hydrocarbyl group

5. The process of claim 1 wherein R^1 and R^2 are independently a C_1 to C_6 hydrocarbon group.

6. The process of claim 1 wherein R^1 and R^2 are a C_1 to C_{20} alkyl, aryl or aralkyl group.

7. The process of claim 1 wherein m is 0, -1, -2, or –3 and n is +3, +4 or +5.

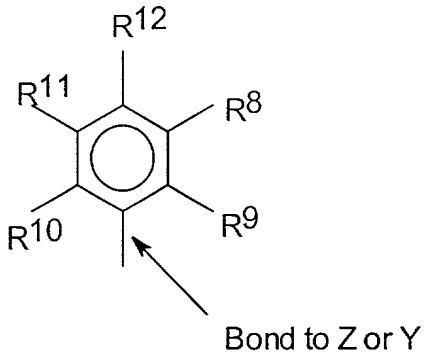
8. The process of claim 1 wherein R^3 is absent or hydrogen or methyl.

9. The process of claim 1 wherein R^4 and R^5 are independently a C_1 to C_{20} hydrocarbon group.

10. The process of claim 1 wherein R^4 and R^5 are independently a C_1 to C_{20} aryl group or a C_1 to C_{20} aralkyl group.

11. The process of claim 1 wherein R^4 and R^5 are independently a cyclic aralkyl group.

12. The process of claim 1 wherein R^4 and R^5 are independently a group represented by the following formula:



wherein

each R^8 to R^{12} are independently hydrogen, or a C_1 to C_{20} alkyl group, a heteroatom, or a heteroatom containing group having up to 40 carbon atoms, and any two R groups can combine to form a cyclic group or a heterocyclic group.

13. The process of claim 12 wherein

R^8 is methyl, ethyl, propyl or butyl and/or

R^9 is methyl, ethyl, propyl or butyl, and/or

R^{10} is methyl, ethyl, propyl or butyl, and/or

R^{11} is methyl, ethyl, propyl or butyl and/or

R^{12} is methyl, ethyl, propyl or butyl.

14. The process of claim 13 wherein

R^9, R^{10} and R^{12} are methyl and R^8 and R^{11} are hydrogen.

15. The process of claim 1 wherein the activator comprises alkyl aluminum compounds, alumoxanes, modified alumoxanes, non-coordinating anions, boranes, borates and/or ionizing compounds.

16. The process of claim 1 wherein the olefin comprises ethylene.

17. The process of claim 1 wherein the olefin comprises propylene.

18. The process of claim 1 wherein the olefin comprises ethylene and a C_3 to C_{20} alpha olefin.

19. The process of claim 1, wherein the olefin comprises ethylene and hexene and/or butene.

20. The process of claim 1, wherein the polymer produced has a molecular weight of 200,000 Daltons or more.

21. The process of claim 1 wherein the transition metal compound and/or the activator are placed on a support before being placed in the gas or slurry phase.

22. The process of claim 21 wherein the support is a finely divided polyolefin, talc, or an oxide of silica, magnesia, titania, alumina, or silica-alumina.

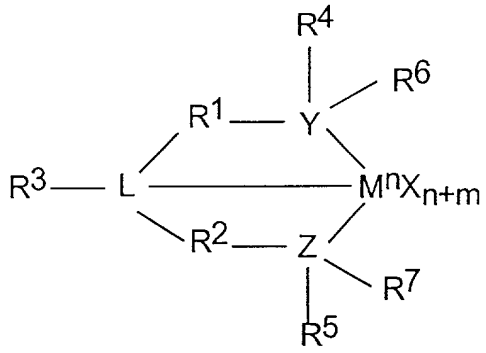
23. The process of claim 1 wherein the transition metal compound and the activator are combined, then placed on a support, then placed in the gas or slurry phase.

24. The process of claim 1 wherein a metal stearate is combined with the transition metal compound and/or the activator and/or a support.

25. The process of claim 24 wherein the metal stearate is an aluminum stearate.

26. The process of claim 25 wherein the aluminum stearate is aluminum distearate.

27. A polymerization process comprising combining in the gas or slurry phase an olefin with an activator, a support and a compound represented by the following formula:



wherein

M is a group 3 to 14 metal,

each X is independently an anionic leaving group,

n is the oxidation state of M,

m is the formal charge of the YZL ligand,

Y is a group 15 element,

Z is a group 15 element,

L is a group 15 or 16 element,

R^1 and R^2 are independently a C_1 to C_{20} hydrocarbon group, a heteroatom containing group, silicon, germanium, tin, lead, phosphorus, a halogen,

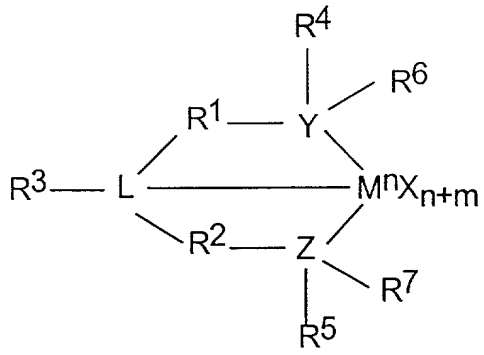
R^1 and R^2 may also be interconnected to each other,

R^3 is absent, or is hydrogen, a group 14 atom containing group, a halogen, a heteroatom containing group,

R^4 and R^5 are independently an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, or multiple ring system,

R^6 and R^7 are independently absent or hydrogen, halogen, a heteroatom or a hydrocarbyl group, or a heteroatom containing group, provided however that L is bound to one of Y or Z and one of R^1 or R^2 is bound to L and not to Y or Z.

28. A process to produce a film comprising extruding, blowing or casting a film from polymer produced by a polymerization process comprising combining an olefin in the gas or slurry phase with an activator, a support and a compound represented by the following formula:



wherein

M is a group 3 to 14 metal,

each X is independently an anionic leaving group,

n is the oxidation state of M,

m is the formal charge of the YZL ligand,

Y is a group 15 element,

Z is a group 15 element,

L is a group 15 or 16 element,

R^1 and R^2 are independently a C_1 to C_{20} hydrocarbon group, a heteroatom containing group, silicon, germanium, tin, lead, phosphorus, a halogen,

R^1 and R^2 may also be interconnected to each other,

R^3 is absent, or is hydrogen, a group 14 atom containing group, a halogen, a heteroatom containing group,

R^4 and R^5 are independently an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, or multiple ring system,

R^6 and R^7 are independently absent or hydrogen, halogen, a heteroatom or a hydrocarbyl group, or a heteroatom containing group.

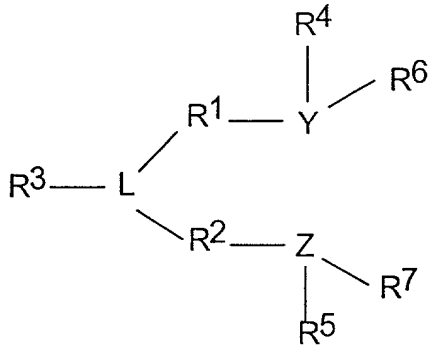
29. The method of claim 28 wherein the film is a blown film.

30. A method to prepare a metal compound comprising reacting a neutral ligand with a compound represented by the formula M^nX_n (where M is a group 3-14 metal, n is the oxidation state of M, X is an anionic group) in a non-coordinating or weakly coordinating solvent, at about 20 to about 100 °C, then treating the mixture with an excess of an alkylating agent, then recovering the metal complex.

31. The method of claim 30 wherein the solvent has a boiling point above 60 °C.

32. The method of claim 30 wherein the solvent is ether, toluene, xylene, benzene, methylene chloride and/or hexane.

33. The method of claim 30 wherein the neutral ligand is represented by the formula:



Y is a group 15 element,

Z is a group 15 element,

L is a group 15 or 16 element,

R^1 and R^2 are independently a C_1 to C_{20} hydrocarbon group, a heteroatom containing group, silicon, germanium, tin, lead, phosphorus, a halogen,

R^1 and R^2 may also be interconnected to each other,

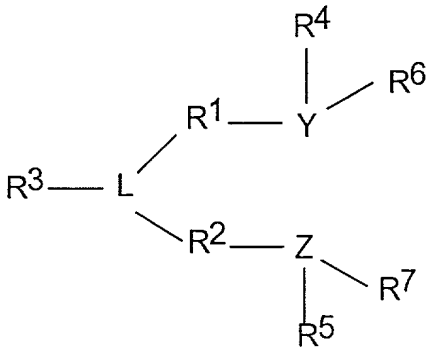
R^3 is absent, or is hydrogen, a group 14 atom containing group, a halogen, a heteroatom containing group,

R^4 and R^5 are independently an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, or multiple ring system,

R^6 and R^7 are independently absent or hydrogen, halogen, a heteroatom or a hydrocarbyl group, or a heteroatom containing group.

34. A method to prepare a metal adduct comprising reacting a neutral ligand with a compound represented by the formula M^nX_n (where M is Zr or Hf, n is the oxidation state of M, X is a halogen) in a non-coordinating or weakly coordinating solvent, at 20°C or more, then recovering the metal adduct.

35. The method of claim 34, wherein the neutral ligand is represented by the formula:



Y is a group 15 element,

Z is a group 15 element,

L is a group 15 or 16 element,

R^1 and R^2 are independently a C_1 to C_{20} hydrocarbon group, a heteroatom containing group, silicon, germanium, tin, lead, phosphorus, a halogen,

R^1 and R^2 may also be interconnected to each other,

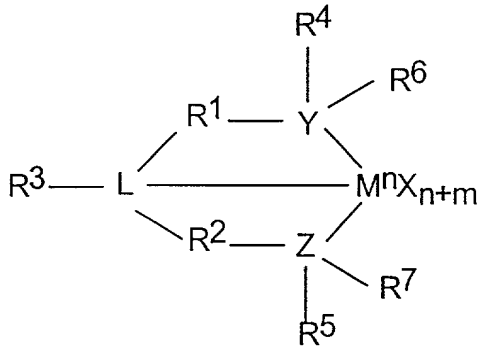
R^3 is absent, or is hydrogen, a group 14 atom containing group, a halogen, a heteroatom containing group,

R^4 and R^5 are independently an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, or multiple ring system,

R^6 and R^7 are independently absent or hydrogen, halogen, a heteroatom or a hydrocarbyl group, or a heteroatom containing group

36. The reaction product of a neutral ligand reacted with a compound represented by the formula M^nX_n (where M is Zr or Hf, n is the oxidation state of M, X is an anionic leaving group), in a non-coordinating or weakly coordinating solvent at about 20 to about 100 °C.

37. A composition represented by the formula:



wherein

M is a group 3 to 14 metal,

each X is independently an anionic leaving group,

n is the oxidation state of M,

m is the formal charge of the YZL ligand,

Y is a group 15 element,

Z is a group 15 element,

L is a group 15 or 16 element,

R^1 and R^2 are independently a C_1 to C_{20} hydrocarbon group, a heteroatom containing group, silicon, germanium, tin, lead, phosphorus, a halogen,

R^1 and R^2 may also be interconnected to each other,

R^3 is absent, or is hydrogen, a group 14 atom containing group, a halogen, a heteroatom containing group,

R^4 and R^5 are independently an aryl group, a substituted aryl group, a cyclic alkyl group, a substituted cyclic alkyl group, or multiple ring system,
R^6 and R^7 are independently absent or hydrogen, halogen, a heteroatom or a hydrocarbyl group, or a heteroatom containing group.

38. The composition of claim 37 wherein M is a group 4, 5 or 6 transition metal.

39. The composition of claim 37 wherein M is zirconium or hafnium.

40. The composition of claim 37 wherein each X is independently hydrogen, halogen or a hydrocarbyl group

41. The composition of claim 37 wherein R^1 and R^2 are independently a C_1 to C_6 hydrocarbon group.

42. The composition of claim 37 wherein R^1 and R^2 are a C_1 to C_{20} alkyl, aryl or aralkyl group.

43. The composition of claim 37 wherein m is 0, -1, -2, or –3 and n is +3, +4 or +5.

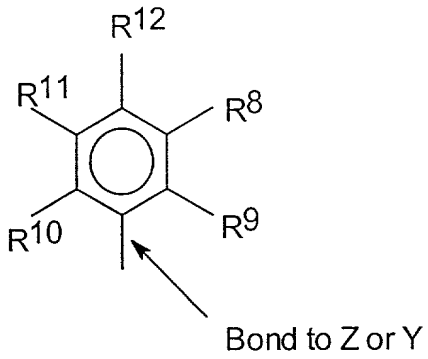
44. The composition of claim 37 wherein R^3 is absent or hydrogen or methyl.

45. The composition of claim 37 wherein R^4 and R^5 are independently a C_1 to C_{20} hydrocarbon group.

46. The composition of claim 37 wherein R^4 and R^5 are independently a C_1 to C_{20} aryl group or a C_1 to C_{20} aralkyl group.

47. The composition of claim 37 wherein R^4 and R^5 are independently a cyclic aralkyl group.

48. The composition of claim 37 wherein R^4 and R^5 are independently a group represented by the following formula:



wherein

each R^8 to R^{12} are independently hydrogen, or a C_1 to C_{20} alkyl group, a heteroatom, or a heteroatom containing group having up to 40 carbon atoms, and any two R groups can combine to form a cyclic group or a heterocyclic group.

49. The composition of claim 48 wherein

R^8 is methyl, ethyl, propyl or butyl and/or

R^9 is methyl, ethyl, propyl or butyl, and/or

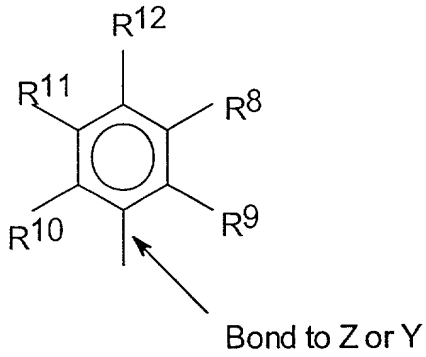
R^{10} is methyl, ethyl, propyl or butyl, and/or

R^{11} is methyl, ethyl, propyl or butyl and/or

R^{12} is methyl, ethyl, propyl or butyl.

50. The composition of claim 37 wherein R^9, R^{10} and R^{12} are methyl and R^8 and R^{11} are hydrogen.

51. The composition of claim 37 wherein M is zirconium, each of Y, A and L is nitrogen, each of R^1 and R^2 is $-CH_2-CH_2$, R^3 is hydrogen, R^6 and R^7 are absent and each of R^4 and R^5 is a group represented by the formula:



wherein

each R^8 to R^{12} are independently hydrogen, or a C_1 to C_{20} alkyl group, a heteroatom, or a heteroatom containing group having up to 40 carbon atoms, and any two R groups can combine to form a cyclic group or a heterocyclic group.

52. The composition of claim 51 wherein each of R^4 and R^5 is represented by the formula: